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The accompanying extract from an article on "Some Diseases of Palms" by Dr. E. J. Butler M.B., F.L.S., Imperial Mycologist, Agricultural Research Institute, Pusa, published in the "Agricultural Journal of India" for October 1906, and containing some notes on "*Kole roga*" disease of betel-nut palms, is republished for general information. Discussion of the subject is invited.

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SOME DISEASES OF PALMS.

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FUNGUS diseases of palms are rare, a fortunate matter if we consider the extraordinary value of these trees to the people of tropical countries. A few have appeared in India in recent years, each apparently confined to a particular part of the country and, while due to different causes, agreeing in their general effects.

KOLE ROGA DISEASE OF BETEL PALMS.

A disease of betel-nut palms (*Areca Catechu*) has been known in the Malnad districts of Mysore particularly near Koppa for many years. It is locally termed "kole roga" or black rot. Up to the present it has not been found elsewhere and, as it does not appear to have extended much during the time it has been observed, it is probably favoured by the special climatic conditions of the locality where it occurs.

The first symptom of the disease appears at the time of flowering. A number of the flowers fall without setting fruits, and their stalks blacken and putrify. The rot gradually extends along the inflorescence and affects the stalks on which nuts are forming, causing the latter to drop while immature. Very often the damage does not stop here. The flower stalk arises from the axil of the lowest leaf and, therefore, leads directly to the base of the sweet green part at the top of the stem. This green portion consists of a number of leaf sheaths which clasp the young growing end of the palm, forming a thick protective covering to the growing point. The lowest of these sheaths becomes affected near the point of origin of the flower stalk, and a patch of rot makes its appearance at this point. The sheaths next underlying the first are then attacked and, since the internal parts are softer than those outside, the rot spreads with increasing rapidity as it approaches the apical bud. When the growing point in the centre of the bud is reached, it also is destroyed, and the whole head withers and falls off. Not alone therefore is the crop lost, but the whole tree is killed, the damage caused in the affected districts being very heavy.

In the disease spots on the leaf sheaths and also on the withered fruit stalks, a fungus of the genus *Phytophthora* is found. There is little doubt that this is the cause of the disease. The few species of *Phytophthora* are all virulent parasites, and though the well-known *Phytophthora infestans*, the cause of the potato disease, has been grown on dead substances, its development is much less vigorous than on its living host. The betel palm *Phytophthora* is evidently, from its position, anatomical characters and the enormous quantity of spores which it produces, an active parasite.

The fungus consists of a mycelium or vegetative part living within the tissues of the palm and extending out on to the surface, and of sporangia or reproductive bodies formed exclusively on the external filaments of the mycelium. The internal part consists of colourless threads lying between the cells. Here and there these filaments reach the surface and grow out into short branched threads. At the ends of these, and also sometimes on short stalks set laterally, the sporangia are produced. They are pear-shaped bodies with the broad end attached to the stalk, from which they fall easily. In water they germinate rapidly, giving rise each to a dozen or more tiny swimming spores, the zoospores. These swim off in all directions and after a time come to rest, get quite round and in their turn germinate by putting out a thread. It is by means of these sporangia and zoospores that the disease is propagated.

Since for their proper germination *Phytophthora* sporangia require to fall into water, most if not all the diseases due to these fungi are closely dependent on conditions of moisture and rainfall. For the spread of the betel-nut disease, which appears to begin on the flower and fruit stalks, it is necessary that the moisture conditions should be favourable during the time of setting of the fruit. The heavy monsoon rains in these parts of Mysore begin in June and last until the end of August or September. The following observations may serve to explain the increase in severity of the disease in recent years, and also its restriction to a single area.

When the disease first made its appearance, some thirty or forty years ago, it was customary to harvest the nuts in November or December. For the last twenty years the harvest has become earlier, being sometimes collected as soon as July or August. This indicates a change in the habit of the tree, due either to a different method of treatment or the introduction of an earlier variety. The effect of this is to expose the fruit stalks to infection at a time when the